any person who will hold strictly to the distinctive characters mentioned. But unfortunately Mr. Binney has placed *P. fontana*, having only *three* whorls, *P. plicata*, having *four to five* whorls, and two other species having *five* whorls each, and two species having flattened whorls, in the synonymy of this species, which has *four convex* whorls. There never can be a systematic classification of species until we cease to mix forms in this manner. The *number* and *form* of the whorls are the most reliable characters upon which a species can be based. It is one of the laws of nature that every animal, every bird and every insect, of the same species, builds its house in the same form. So the structures of every snail shell of the same species must be substantially the same as to texture, and number, and form of whorls. They may vary in color, height of spire, form of aperture and other characters that may be affected by accident or environment, but as to the structural form of its own skeleton it must follow its progenitors. So I conclude that every adult member of the same species must have the same number of whorls.

Coming back again to the main question. What is *Physa heterostropha* Say? It is a shell subovate in form, having *four* whorls, spire whorls *somewhat convex*, sutures *impressed*, spire elevated, terminating in an *acute* apex, aperture large and oval, but not inflated. The spire whorls are more convex than in *P. gyrina* Say and not so much as in *P. showalteri* Lea or *P. halei* Lea. It holds an intermediate place between the flattened and most convex whorls. It is never cylindrical, and the type is not inflated nor ventricose. Varieties may be slightly inflated but never so much as to resemble *P. vinosa* Gld. or *P. sayii* Tappan, which are frequently taken for this species.

If I am not correct, will some person who has seen the type specimen, revise and correct the description herein given?

NOTES ON THE NORTH AMERICAN SPECIES OF SUCCINEA.

BY T. D. A. COCKERELL.

For some time past I have been accumulating notes on the North American *Succineæ*, hoping to be able to classify them more pre-

cisely than has hitherto been done. As I have no longer time or opportunity for this work, I venture to put together the following notes, on the chance of their proving useful to other students. The genus is a most difficult one, and until someone will elaborately monograph the American species as Baudon has the French ones, we seem hardly likely to arrive at any satisfactory arrangement. With regard to the opinions given below, it is to be understood that they are nothing better than *opinions*, founded on the material examined. Further study with more abundant material would very likely cause some of them to be altered.

The American species of *Succinea* may be divided into four sections, three of which have received subgeneric names.

Sect. 1. *Amphibinæ*.

= *Amphibina* (Htm.) Mörch.

(1.) *Succinea pfeifferi* Rossm. Many of the American forms of *ovalis* Gould are not to be separated from the European *pfeifferi*, while others, also hardly distinct from *ovalis*, might in the absence of intermediates be supposed to represent a peculiarly American species. The American forms of *Succinea*, both in this and other groups, are very closely allied, but at the same time seem more constant in their slight peculiarities than those of Europe. In *Ann. and Mag. of Nat. Hist.*, March, 1887, I referred *ovalis* to *pfeifferi*, and nothing since has appeared to prove otherwise.

(1a.) *S. pfeifferi* var. *brevis* Pascal. This variety was originally called *brevis*, but afterwards unnecessarily changed by Baudon to *brevispirata*, because there is a *S. brevis* in Central America. I received a characteristic specimen, collected by Mr. D. B. Cockerell at Toronto, Canada. In shape, this variety is very like *S. higginsi*, and probably the two will be found to intergrade.

(2.) *S. higginsi* Bland. Probably a variety or subspecies of *pfeifferi*, but a specimen marked *higginsi*, which I saw in the Binney and Bland Collection, at the American Museum of Natural History,[1] seemed to have affinity with *S. elegans*, while another in the same collection resembled *pfeifferi* very closely.

[1] I was much indebted to Mr. Sanderson Smith for his kindness in showing me this collection when I was in New York.

(3.) *S. haleana* Lea. A specimen in the Binney and Bland Collection, from Alexandria, La., marked "*halei* Lea, type," seems to me to be specifically identical with *ovalis* Gould.

(4.) *S. retusa* Lea. Said to be a variety or subspecies of *ovalis*, but so far as I was able to judge from a specimen in the Binney and Bland Collection, it is a valid species allied to *S. elegans*.

(5.) *S. concordialis* Gould. Mr. J. A. Singley sent me this from Lee Co., Texas. It is allied to *pfeifferi*, but more pellucid and shiny; thin but rather strong; color, very pale horn. I have also seen a specimen in the Binney and Bland Collection.

(6.) *S. forsheyi* Lea. A specimen in the Binney and Bland Collection is from Rutersville, Texas, the original locality. It is shiny and very near to *pfeifferi*.

(7.) *S. nuttalliana* Lea. Mr. J. H. Thomson sent me five specimens collected in Wyoming in 1877, which no doubt belong to *nuttalliana*. They are shiny, with lines of growth well marked; in shape, like *pfeifferi*, varying towards *avara;* color, like *avara*. A specimen in the Binney and Bland Collection, from Portland, Oregon, is similar.

(8.) *S. elegans* Risso. Mr. D. B. Cockerell sent me specimens found by rivers and streams at Toronto, which I could not distinguish specifically from the European *elegans*. At the same time, they are equally close to *S. haydeni* which may, I think, be considered a variety or subspecies of *elegans*. A specimen of *haydeni* in the Binney and Bland Collection tends to confirm this opinion.

(9.) *S. hawkinsi* Baird. This I have not seen, but it is apparently very close to *elegans*.

(*To be continued.*)

GENERAL NOTES.

In the July number of the NAUTILUS it is proposed to begin a series of articles upon the *collection* and *preservation* of shells. Notes bearing upon these subjects will be welcome.

"* * * While at Maldonado, Uruguay, I succeeded in finding *Helix costellata* D'Orb, under dead leaves in damp localities. While in the bay I procured about twenty dredgings with very good results, having at least three species of *Corbula*, and about fifty other